

Fisheries Management of Floodplain Wetlands



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The wetlands in India support subsistence and livelihood to thousands of people through fishing, collecting edible plants, agriculture, water transport, irrigation and fisheries, besides rich biodiversity. Most of the wetlands are directly or indirectly linked to rivers. Of these, wetlands associated with floodplains of rivers (floodplain wetlands) cover an estimated area of 3.54 lakh ha and are a common feature of the Indian landscape, especially along the Ganga and Brahmaputra river systems. They also form a major inland fisheries resource in the country. Fisheries of these wetlands are under open access regimes and fishing is an essential part of the livelihood strategies for hundreds of people associated with these ecosystems. Growing demand for inland fish against the background of a resource that is declining. As a result, the future appears to be for better regulation of conventional capture fisheries but also to pursue methods for production enhancement that are better adapted to the changing environment.

Fisheries Management

There are several options available for the management of fisheries and fish production enhancement of floodplain wetlands, tested and demonstrated by the Central Inland Fisheries Research Institute. Nevertheless, it is not easy to set universal guidelines for these wetlands due to several intermediary situations and location specificity. Hence few general management guidelines are suggested here.



Capture fishery for open wetlands

Floodplain wetlands retaining their riverine connection for a reasonably long period of time are relatively free from weeds. The management strategy can be that of capture fisheries. The approach is to allow natural fish recruitment by conserving and protecting the brooders and juveniles. This involves identification and protection of breeding grounds, brood stock and juveniles; allowing free migration of brooders and juveniles from wetland to river and vice versa.

Culture-based fishery for closed wetlands

Closed floodplain wetlands, in majority of the cases, are characterized by weed infestation and derelict nature, constraining optimization of fish yield from these water bodies. Management of completely closed wetlands or those with a very brief period of connection with the rivers is more like that of culture-based fisheries of small reservoirs. The basic strategy for fish yield enhancement here is stocking and recapture. The growth of fishes in these water bodies will be faster compared to that of reservoirs due to availability of huge reserve of food niches.

Capture and culture-based fisheries

There are management systems, which combine the norms of capture/culture based fisheries and culture fisheries. In this system, the marginal areas of wetlands are cordoned off for culture fishery either in ponds or in pens and the central portion (wetland proper) is left for capture fisheries. Under this system, a series of small enclosures are created along the periphery of the lake, which is leased out to entrepreneurs for fish farming. Some of these enclosures serve as nurseries to rear the seed for both aquaculture and stocking in the wetland. When culture based fishery is practiced, the connecting channel is blocked using wire mesh to prevent the stocked fishes from escaping and the water inflow and out flow is regulated through a sluice installed at the mouth of the channel.

Integrated management

The integration plan envisages developing agriculture and aquaculture in one portion, leaving the other portion for capture and culture based fisheries. A dike can separate the two segments of the wetland while the water flow to agriculture and aquaculture



areas in each segment can be regulated through canals. The central marshy portion can be left intact for harboring the birds that frequent the area. However, the long-term effects of this type of development, on the hydrodynamics and natural biological productivity are not adequately assessed.

Species options

Species management is a very important tool in wetland fishery management. This can be achieved through various options of species enhancement. There are various species options.

Indian major carps

The main species are catla, rohu and mrigal. In the absence or low recruitment, stocking with these species is the best option. These are fast growing species and effective in utilizing the available food niches. Species ratio and density need to be determined based on the strengths of fish food available such as plankton, benthos, detritus, etc.

Indigenous fishes

It is not necessary to develop all the wetlands as carp based fisheries. The natural stock of indigenous fish populations is on the decline in most of the floodplain wetlands in India. *Anabas testudineus*, *Clarias batrachus*, *Ompok* spp., murrels, *Amblypharyngodon mola*, *Gudusia chapra*, *Puntius* spp., etc. are a few among them. The low yield rates of these species, compared to those of major carps, can be compensated with the high price these species fetch in the market and the biodiversity gains of the ecosystem.

Ornamental fishes

Surveys conducted by CIFRI identified 45 species belonging to 16 families in the floodplain wetlands of Assam and 63 species belonging to 23 families in West Bengal, having potential for aquarium purposes. Some of them are *Gagata cenia*, *Brachydanio* sp., *Danio dangila*, *Nandus nandus*, *Badis badis*, *Oreochthys cosuatis*, *Puntius sophore*, *P. conchoni*, *Colisa fasciatus*, *C. sota*, etc. Species like *Puntius sophore*, *P. conchoni*, *Colisa fasciatus*, *C. sota* were successfully bred in captivity also.

Production Enhancement through Enclosure systems

Pens

The investigations conducted by the CIFRI have demonstrated culture of fishes and prawns in enclosures or pens of manageable size and area, erected in the marginal areas of wetlands as effective management tool for realizing additional fish production and income for the poor fishers who depend on the wetlands for their daily livelihood. The pen culture technology developed by the Institute has additional advantage of being low cost, with reasonable return on investment. A production of 1,308 kg ha⁻¹ of freshwater prawn *Macrobrachium rosenbergii*, in four months has been reported from pens and the return on investment was 29.5%. Low cost materials like bamboo, canes, wooden logs, etc. are used for putting up of pens.

Species Used

Species for mixed culture are *Catla catla*, *Hypophthalmichthys molitrix*, *Labeo rohita*, and *Cirrhina mrigala*. Under mixed culture of carps and prawns along with the above species the giant freshwater prawn *Macrobrachium rosenbergii* is ideal. In monoculture using *M. rosenbergii* alone is the most profitable. The species ratio can be, *Catla catla* (20%), *Hypophthalmichthys molitrix* (15%), *Labeo rohita* (20%) and *Cirrhina mrigala* (45%). *Cirrhina mrigala* can be replaced with *Macrobrachium rosenbergii* in mixed culture.

Production estimates

The field trials have indicated that from culture of carps the fish production could be as high as 4000-5000 kg ha⁻¹ year⁻¹. In mixed culture of carps and prawns the yield of carps could be 2000-2500 kg ha⁻¹ year⁻¹ and that of prawns could be 500-800

kg ha⁻¹ year⁻¹. In monoculture of prawns, an average yield of 1300 kg ha⁻¹ in four months of culture period could be achieved.

Cages

Trials with *Labeo gonius* and *L. bata* have attained the targeted growth of 10cm/10g without any supplementary feeding in 90 days in cages. The fry has been reported to grow to fingerling size (10 cm, 12-28 g) in just two months with a survival rate of 68-77% at a stocking density of 30 fry/m². Up to three crops per year could be achieved in cage rearing. However, the cage culture techniques in wetland management need further refinement and studies.

Socio-economics and livelihood

The livelihood issues are much broader than the issues affecting the resources and their management. The floodplain wetland resources are extensive and are not under the control of any single individual. This encourage multiple and conflicting use, which in turn encourage degradation, as no one really cares for it, leading to the decline of environment and productivity. In India, fishers are not the real owners of this resource. They have to pay rent or share of produce to the controllers of the water bodies for fishing or for crafts and gear. Control functions are mostly under the hands of private or commercial entities; the rents collected by them usually are not utilized for fisheries development. The state owned water bodies are under lease arrangements, taking substantial share of the income in the form of rents. In states like West Bengal and Assam, most of the wetlands are managed by cooperative societies. The cooperative managed wetlands do produce good income, which is distributed reasonably among the member fishers and utilized for fisheries development.

